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TRANSPORTING FRESH BEEF TO EUROPEAN MARKETS

– An Interim Report –

Agricultural Research Service

UNITED STATES DEPARTMENT OF AGRICULTURE

PREFACE

This is a report of a preliminary study conducted by the Agricultural Research Service to determine and evaluate various techniques for shipping fresh beef to European markets and to identify areas for improvement. Additional work is being conducted. General supervision was furnished by John E. Clayton, chief, and technical supervision by Robert F. Guilfoy, investigations leader, of the Transportation Research Branch, Transportation and Facilities Research Division. Cooperators include the Market Quality Research Division, Agricultural Research Service; the Livestock and Meat Division, Foreign Agricultural Service; Defense Subsistence Supply Center and the U. S. Army Terminal Command, Atlantic; American Express Company; Moore-McCormick Steamship Lines; and other meat packers, shippers, and transporters in both the United States and Europe. Several other members of the Transportation Research Branch, Agricultural Research Service, contributed ideas.

SUMMARY

Recent shifts in the supply and demand for beef in European markets, coupled with plentiful supplies in this country, offer opportunities for U. S. shippers to develop both short-run and long-run overseas markets.

Transportation researchers studied four techniques for shipping fresh beef to European markets: (1) Refrigerated van containers, (2) American–flag refrigerated holds, (3) foreign–flag refrigerated holds, and (4) banana boats.

Observations were made of shipments of fresh beef hung on overhead rails in two refrigerated van containers. The fresh beef in one of the vans arrived in fair condition while that in the other van arrived in poor condition. Definite conclusions cannot be drawn from these shipments because (1) the transit time—27 days—was unusually long, (2) the carcasses were not thoroughly chilled before loading, and (3) temperatures between 29° and 31°F. were not maintained in one van. Total charges for the van shipments from St. Louis, Mo., to Paris, France, were 10.7 cents per pound, with a load density of 19.5 pounds per cubic foot. By placing a layer of meat on the floor of the van, density could increase to 22 pounds per cubic foot and the cost should decrease to 9.5 cents a pound.

Four methods of stowing fresh beef in refrigerated ships' holds were studied: (1) Stacking; (2) hanging on rack constructed of wood uprights and steel pipes with one layer of beef quarters on the floor: (3) hanging on rack constructed of steel; and (4) stacking on shelf rack. Stacking beef quarters more than one layer high on the floor of the ship's hold adversely affected its condition enough to make this method of stowing unsuitable for overseas commercial shipments of fresh beef. Method (2) yielded a greater load density per cubic foot of available space than any of the other methods, used more of the available load space, delivered the product in excellent condition, and indicated a lower charge per pound of beef. Total charges for shipment of hanging fresh beef using this system would be 11.39 cents a pound from St. Louis, Mo., to Paris, France.

Refrigerated space is available for shipment of fresh beef in foreign–flag vessels. However, because very little freight of this type has been offered in the past, rates are not readily quoted. The use of banana boats for shipping fresh beef is not a promising alternative.

This preliminary study indicates that it is possible to ship American fresh beef to European markets in good condition and at transport costs low enough to be competitive at recent meat prices in certain European markets. Additional research is needed to further reduce transport and handling costs while maintaining the quality of the meat during transit. Reducing these costs would make sales at current prices more profitable to meat producers and possibly enable them to participate more fully in the European beef market in the future, even if prices are lower than they are today.

TRANSPORTING FRESH BEEF TO EUROPEAN MARKETS

–An Interim Report–

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INTRODUCTION

Recent shifts in the supply and demand for beef in European markets, coupled with plentiful supplies in the United States, offer opportunities for U. S. beef shippers to develop both short-run and long-run overseas markets. Several factors have influenced these shifts in the European markets. First, an anticipated increase in output by European production areas failed to occur because of the unusually severe winter of 1963, which appears to have caused heavy liquidation of available livestock to meet normal demand. Local meat production has not kept pace with rising domestic demand. Consequently, prices have risen, particularly in the Common Market countries. Between April 1963 and April 1964 the average wholesale price of beef and veal equivalent to U. S. Good Grade rose 6 to 14 cents a pound. [1]

Second, the European beef supply–demand relationship has been adversely affected by the cutback of export beef from one of Europe's traditional suppliers, Argentina. After 3 years of relatively heavy slaughter because of drought and export demand, Argentine cattlemen are holding back cattle to build up herds. Reduced exports from Argentina can be expected until these herds turn out a greater number of finished animals—possibly not until the end of 1965. [2]

A third factor in the market shifts is the increase in United States production which has tended to push domestic prices downward. With traditional suppliers unable to meet the increasing demand of the European market, the United States has a good opportunity to share in this market in view of the present abundance of beef in this country.

It has been recently reported that chilled and frozen beef offer long-run possibilities for U. S. exports. [3] The United States could benefit from the European beef supply–demand situation and the temporary easing of import restrictions to attract additional imports, if U. S. beef prices were competitive.

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[1] Henderson, Harry W. Western Europe's Rising Food Prices May Affect Farm Import Policies. U. S. Dept. Agr., Foreign Agr. II (22):4. June 1, 1964.

[2] Bates, Quentin R. Argentina Beef Exports To Decline As Ranchers Rebuild Herds, U. S. Dept. Agr., Foreign Agr. II (20):6. May 18, 1964.

[3] Murphey, C. E. Factors in Selling U. S. Cattle Beef to Europe Include Price and Special Import Preferences. U. S. Dept. Agr., Foreign Agr. II (38):10. Sept. 21, 1964.

Exports of U. S. fresh beef to Europe have been almost nonexistent for the past 50 years. Variety meats, such as frozen pork and beef livers, kidneys, and hearts, represent about the only type of meat for which the U. S. presently has a market in Europe. Some frozen beef has been exported to Europe in past years, but the first commercial shipment of fresh beef on any North Atlantic run apparently occurred in June 1964. Military shipments of fresh beef for overseas distribution at U. S. military commissaries began in May 1964 through the Port of New York. The first shipment of fresh beef in van containers to Europe was made in the spring of 1964.

The purpose of this preliminary study was to determine and evaluate the various techniques of shipping fresh beef to European markets and to identify areas for improvement.

Transport researchers studied availability and type of stowage for four techniques of shipping fresh beef to European markets. These were refrigerated van containers, American and foreign–flag refrigerated holds, and banana boats. Test shipments of beef were made in refrigerated van containers and American–flag refrigerated holds and data were obtained on performance and charges. The ability of the transport techniques to maintain desired condition and quality of the product was evaluated by Market Quality Research Division personnel.

REFRIGERATED VAN CONTAINERS

Most of the refrigerated van containers available for shipping beef to European markets are 20 feet long; they are equipped with electric-drive refrigeration units powered by diesel-electric plants; and they may also operate on ship's power. The self–contained system allows independent control of the temperature and humidity of each container to meet specific requirements.

Methodology

A shipment of fresh beef consisting of 252 pistolas[4] was loaded into two precooled vans—I and II—at a Midwestern packinghouse for shipment to customers in Paris, France. Both vans were precooled to 30° F. before loading the meat. The beef pistolas were U.S. Utility Grade. Van I contained 125 pistolas weighing 15,371 pounds and Van II contained 127 pistolas weighing 16,022 pounds. The beef was wrapped with kraft crinkle paper and two layers of stockinettes, then stowed in the vans on meathooks hung from adjustable rails (fig. 1). The meat rails in both vans could be removed for transporting other commodities.

At the time the meat was loaded into the vans, internal temperatures of the rounds were obtained using a dial thermometer. In addition, a number of temperature probes (thermocouples) were embedded in the eye *(longissimus dorsi)* muscle of the loin and in the deep muscles of the round. The leads to the probes went to the outside of the vans where they could be connected to a temperature measuring device (potentiometer). In this way, readings of the internal meat temperatures were obtained without opening the vans. Readings were obtained at four points during the trip to Paris: (1) Immediately after sealing the vans; (2) 4 days later in New York City, before the vans were loaded aboard the ship; (3) in Le Havre, France, 24 days after loading; and (4) in Paris, 27 days after loading.

Relative humidity was measured by a portable relative humidity indicator with sensing elements to determine the percent of moisture in the air.

Two hundred and fifty pounds of dry ice was placed on the floor in the rear of Van I before sealing the van, but none was placed in Van II.

[4] A pistola includes the round, the loin, and part or all of the ribs.

Figure 1.—Hanging pistolas on meat rails in refrigerated van containers.

Results

Loading Density.—Hanging beef in the van containers yielded a loading density of 19.5 and 18.7 pounds per cubic foot. Ninety percent of the available space of 918 cubic feet was used in loading the hanging beef. A layer of meat on the floor of the van could increase the density to 22.0 pounds per cubic foot.

Temperature and Humidity.—Table 1 shows the range in internal temperature of the beef rounds recorded at various times during transit to Paris, France. Approximately 40 percent of the pistolas in each van were from animals slaughtered the day before loading. At loading, the higher internal temperatures of the beef rounds were found in these pistolas.

Table 1.—Internal temperature ranges of fresh beef rounds transported in refrigerated vans to Paris, France

Van	Temperature ranges at loading and after—			
	Loading	4 days (New York City)	24 days (Le Havre, France)	27 days (Paris, France)
	°F.	°F.	°F.	°F.
Van I (dry ice added)	31.5 - 52.0	29.3 - 33.5	28.0 - 30.8	27.3 - 31.6
Van II (no dry ice)	32.5 - 51.5	32.6 - 37.0	32.4 - 38.8	33.0 - 38.0

Relative humidity in Van I was 80-81 percent upon arrival in Paris and in Van II, 73-75 percent.

Condition.—In general, the meat in Van I arrived in fair condition. Some bacterial slime growth was evident where the rounds came in contact with each other, and dehydration had occurred, particularly in the exposed meat tissues of the loin. The meat had a strong, stale, musty odor when first unloaded from the van, but this odor lessened somewhat after the beef had been in the open air of the market. The stockinettes had very little staining.

The beef in Van II arrived in poor condition. The meat had extensive bacterial and mold growth which caused a strong off-odor. The meat tissues along the aitchbone were completely covered with bacterial growth and the outsides of the rounds were black with the growth of mold. The meat tissues had been partially decomposed by these organisms and were flaccid.

Charges

Total Charge.—The total or door-to-door charge for shipping a van container of fresh beef from Rochester, N.Y., for example, to Paris, France, was $1,650 per container, based on a minimum of two containers per month. This was 10.3 and 10.7 cents a pound, based on the weights transported in the two containers observed (table 2). If the shipments had originated in Omaha, Neb., the total through charge would have been $1,806 per container or 11.3 and 11.7 cents a pound. The St. Louis to Paris charge was $1,707 per container or 10.7 and 11.1 cents a pound. If 30 containers per month were shipped, the total charges would decrease $200 per container, and $300 per container for 40 or more containers a month, according to rate quotations at the time this research was conducted. The charges per pound could be decreased if the vans could be loaded to 18,000 pounds through improved loading techniques.

Table 2.—Total charges per pound of meat for shipments of fresh beef quarters in refrigerated van containers to Paris, France, from selected origins in the United States[1]

Origin	For weights observed, at port–to–port rate for 2 containers per month[2]		For 18,000 pounds per van, at port–to–port rate for monthly shipments of[3]		
	Van I (15,371 pounds)	Van II (16,022 pounds)	2 containers	30 containers	40 containers
	Cents	*Cents*	*Cents*	*Cents*	*Cents*
St. Louis, Mo.	11.1	10.7	9.48	8.37	7.81
Rochester, N. Y.	10.7	10.3	9.17	8.06	7.50
Omaha, Nebr.	11.7	11.3	10.04	8.92	8.37

[1] Includes port–to–port and inland transport charges from point of origin and at point of arrival. Does not include duty payments, related taxes, insurance, and inspection charge at arrival port.

[2] Port–to–port rate for two containers per month was $1,200. Density was 18.7 pounds per cubic foot in Van I, and 19.5 pounds per cubic foot in Van II.

[3] Total weight of 18,000 pounds could be obtained with improved loading by placing one layer of meat on the floor of the van; density would be 22.0 pounds per cubic foot. The port–to–port rate for 30 containers per month would be $1,000 per container, and for 40 containers, $900.

These total charges cover (1) inland transportation—from consignor's packing plant to New York and from European port of arrival to consignee's warehouse; (2) port–to–port charges—foreign freight forwarding, documentation at New York and at overseas port, customs clearance, ocean freight, cartage delivery to consignee's warehouse if located within the metropolitan area of the overseas port of arrival; and (3) return of meat hooks to the shipper. Duty payments, related taxes, insurance, and inspection charge at port of arrival are not included in these charges. The containers were shipped on a through–bill–of–lading.

Port–to–Port Charge.—The port–to–port charge per container, minimum of two containers per month, was $1,200 from New York to Le Havre, France, or Rotterdam, Holland. This was 7.5 and 7.8 cents a pound, based on the total weights in the containers observed. Port–to–port charges for 30 containers a month were quoted at $1,000 each, and $900 each for 40 or more containers a month.

Inland Transport.—Piggyback charges for cartage from the inland cities of origin to the Port of New York depend upon the location of the shipping point. For example, the charge from Rochester is $150, from Omaha, $306, and from St. Louis, $207 per container. This is an estimated charge per pound of 1 cent and 1.3 cents for the weights in the two vans in the test shipment.

A flat fee of $300 per container was charged for transportation and delivery of the van to the consignee's warehouse if located outside the metropolitan area of the port of arrival, but within the same country. Deliveries not in the same country—vans from Rotterdam to Switzerland, for example—would require a charge greater than $300 per container.

Laid–Down Costs and Prices, Paris, France

The average wholesale price of U. S. Good Grade beef for the month of June 1964 was 33.16 cents a pound f.o.b. St. Louis. Adding this price to the transport cost indicated above would give a laid–down cost in Paris of 43.86 cents per pound for a 16,000–pound refrigerated van shipment from St. Louis. Custom duties, taxes, insurance, and inspection charges at the port of arrival are not included in this cost, but the vendor's profit is figured into the f.o.b. St. Louis price. The average wholesale price of fresh beef halves, first quality, roughly comparable to U. S. Good Grade, for the month of June 1964 in Paris was 54.63 cents per pound.

AMERICAN–FLAG REFRIGERATED HOLDS

American–flag vessels with refrigerated holds are available for shipment of fresh beef from American to European ports. These vessels do not have permanent meat rails for hanging fresh beef.

All tests conducted on these vessels were made with Defense Department beef shipments bound for overseas U. S. military bases. This beef was U. S. Good Grade fresh hindquarters and forequarters.

Methodology

Because most American–flag ships do not have meat rails, military shipments of fresh beef to Europe (Rotterdam, Holland) ordinarily are stacked four to six layers high on the floor of the ship's refrigerated boxes. Two wooden boards, 2 by 6 inches and of varied lengths, are placed between the layers to permit air circulation around the stacked beef (fig. 2).

In addition to stacking beef quarters in the ships' refrigerated holds, transportation researchers experimented with three other ways of stowing beef quarters—hanging them from two types of racks and stacking them on shelves in another type of rack. All three racks were developed by Department of Agriculture transport researchers.

Rack A for hanging beef was constructed of 2–by–6–inch boards and galvanized pipe (fig. 3). The boards were used to construct two wooden frames which were placed at opposite sides of the refrigerated box. The steel pipes were cut the width of the box and were set in notches cut in the top of the frames. The pipes also were supported by notched 2–by–4–inch uprights where the weight of the beef made this necessary. The quarters of beef were hung from the pipes with standard transit meat hooks, and one layer of beef was placed on the floor directly under the hanging meat. All the weight of the rack and the beef was supported by the floor of the hold.

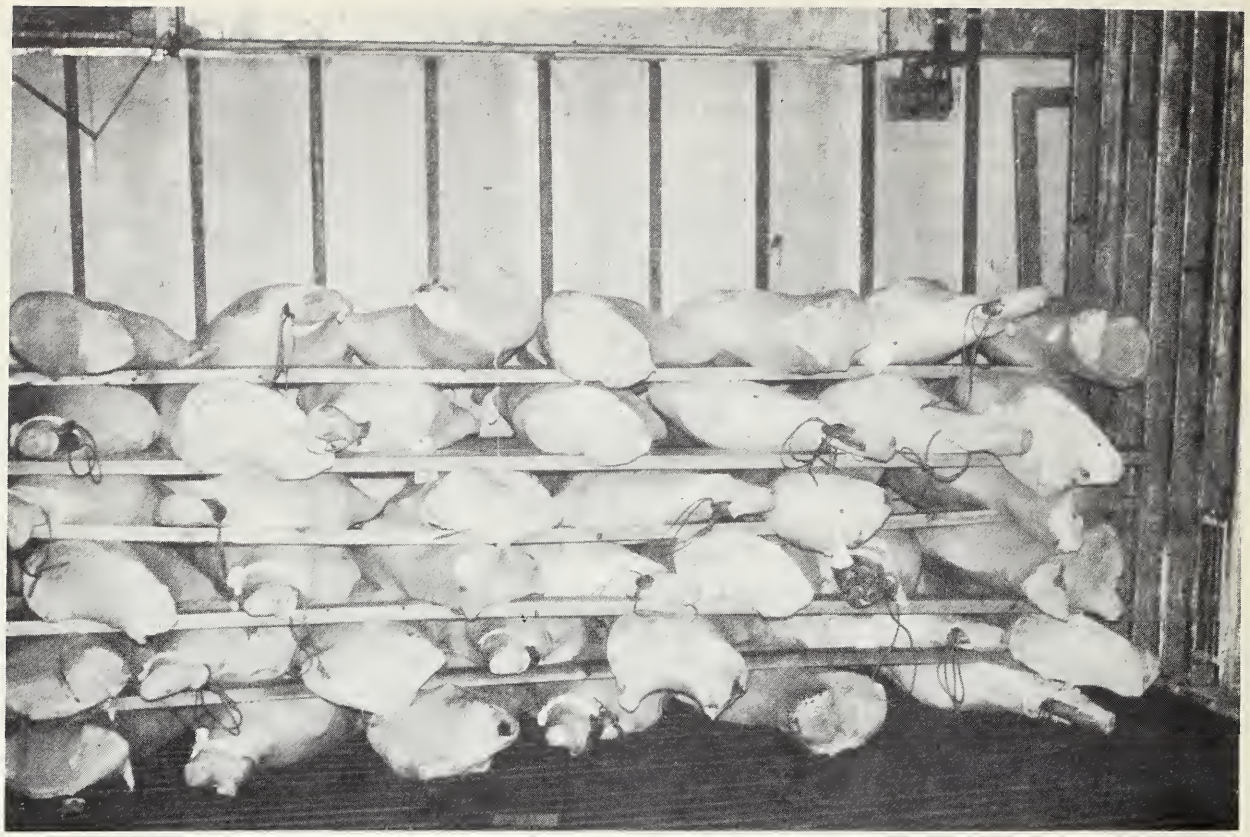

Figure 2.—Fresh beef quarters stacked in a ship's refrigerated hold.

Figure 3.—Fresh beef quarters hanging from rack A, constructed of wood uprights and steel pipe.

The other rack for hanging beef, rack B, was constructed of angular steel and the quarters were hung with meathooks from overhead rails (fig. 4). All the weight of the meat in the rack was supported by the floor.

Figure 4.—Fresh beef quarters hanging from rack B, constructed of angular steel.

A rack with shelves, rack C, also placed all the load weight on the hold's floor (fig. 5). It was constructed of angular steel framing and wooden shelves. Two quarters of beef were placed bone down on each shelf of the rack.

The four types of stowage were used in refrigerated boxes of similar design and equipment. Air temperatures of 28° to 30° F. were maintained throughout the week–long voyages of all test shipments observed.

Internal temperatures of the rounds were obtained using a dial thermometer. Relative humidity was obtained using a portable relative humidity indicator.

Results

Loading Density.—Stacking the beef six layers high achieved a density of 22.1 pounds per cubic foot of space occupied, but the density in terms of the total space available was only 13.2 pounds per cubic foot (table 3). Beef stacked six layers high occupied 60 percent of the available space in a refrigerated box 7 feet 9 inches high. Forty percent of the available space is used when beef is stacked four layers high.

Figure 5.—Fresh beef quarters placed on a rack with shelves, rack C.

Table 3.—Utilization factors for four methods of stowage of fresh beef in American-flag refrigerated holds

Stowage methods	Density, pounds per cubic foot of		Percent of available cubic space used [1]
	Space available for stowing beef	Space occupied by beef	
Beef stacked 6-high with 2″ x 6″ x 12′ boards between layers (present military method)	13.2	22.1	60
Rack A, wooden uprights and steel pipe, meat hung by meathooks, one layer of meat on the floor	18.1	21.6	84
Rack B, angular steel, meat hung by meathooks	13.7	18.9	75
Rack C, angular steel, with wooden shelves, meat in one layer on each shelf	8.5	11.5	75

[1] These figures are for an 8′6″ high hold; allowing 9″ air space above load, available height is 7′9″.

A density of 21.6 pounds per cubic foot of occupied space was achieved by hanging beef on rack A and placing one layer on the floor. The density in terms of the total space available was 18.1 pounds per cubic foot. This system of loading occupied 84 percent of the available space in a 7–foot 9–inch high refrigerated box. Improvements in hanging and nesting quarters could make it possible to increase by 11 percent the amount of beef accommodated by the rack and thereby achieve a density of 23.9 pounds per cubic foot of occupied space and 20.1 pounds per cubic foot of space available.

Rack B yielded a density of 18.9 pounds per cubic foot of space occupied and 13.7 pounds per cubic foot of space available. The density of rack C was 11.5 pounds per cubic foot of occupied space and 8.5 pounds per cubic foot of available space. These types of loading occupied 75 percent of the available loading space.

Temperature and Humidity.—A number of U. S. vendors supplied the meat for each military shipment. The internal temperatures of the beef rounds upon arrival at dockside in New York City ranged from 27° to 42° F.

Upon arrival at the European port the internal temperatures of the rounds in the stacked beef hindquarters were 28° to 29° F. in the top layers and 30° to 32° F. in the lower layers. Internal temperature of the meat where the 2-by-6-inch boards came in contact with the beef quarters was 2° to 3° higher than that of the rest of the beef hindquarter in one shipment. This higher temperature may have been caused because precooled boards were not used when the hindquarters were stacked in the ships' refrigerated holds.

The temperature of the meat transported in rack A was 28° to 29° F. The internal temperatures of the beef quarters placed on the floor directly under the rack were 28.5° to 29.5°. These temperatures indicated that the hanging beef hindquarters received the fullest benefit of the refrigeration system and that the layer of hindquarters on the floor of the ships' refrigerated box received adequate air circulation as well.

In rack B each of the beef hindquarters had an internal temperature of the round of 30° F. which indicated an adequate flow of cool air around each quarter of beef. The internal temperature of the round was 29° to 30° in rack C.

Relative humidity was maintained between 71 and 75 percent in all tests.

Condition.—The top layer of the stacked, thoroughly chilled beef arrived in good condition and showed no evidence of abrasions, indentations, slime, or off–color. The second layer from the top and successive layers down to the floor all had meat deformed by the 2–by–6 boards. The quarters whose internal temperatures of the round were 38° to 42° F. at time of loading at New York had slimy surfaces and considerable depressions (up to 2½ inches deep) from the 2-by-6-inch boards. There was extensive bacterial growth in an area about 6 inches wide where the boards touched the meat. This area of the beef also had a sour odor.

There was considerable staining, from juices squeezed out of the beef, of the stockinettes covering the quarters. This was evidence of a breakdown in tissue from the overhead weight (fig. 6). The overhead weight also contributed to considerable deformation of the bottom layer of meat. In some cases, the beef rounds were depressed from a normal thickness of 8 inches to 4 inches (fig. 7). The hindquarters next to the ship's walls were very irregular in shape, especially where the end of the 2–by–6 board was placed in the middle of the round. A deep hole was left in the round by the boards and further deformation occurred if a little shifting of the beef quarter took place (fig. 8).

The meat hung in rack A arrived in Rotterdam after a week's voyage. One day of rough, stormy weather was encountered. All quarters hung on the rack were hanging upon arrival, and all quarters, including those in the layer on the floor, were in excellent condition. Stockinettes were free of staining, and the quarters were free of discoloration and dehydration. No bacteria or mold growth was visible on any area of the quarters. The meat had a fresh meat odor; no off-odor could be detected. The rack frame and pipes withstood the voyage in good condition. There was no evidence of shifting, bending of pipes, or splitting of any piece of lumber used in the frame.

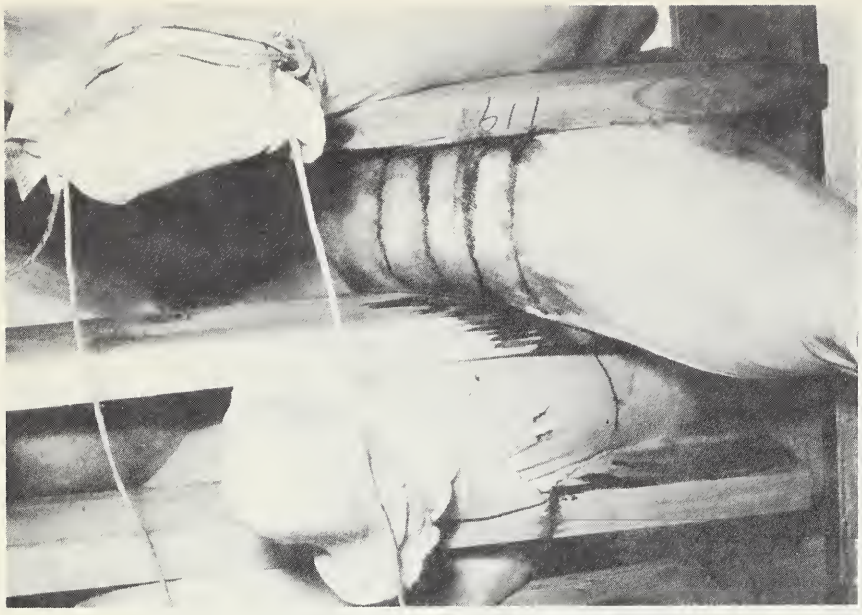

Figure 6.—Beef hindquarters showing staining of stockinettes caused by compression of the round from overhead weight.

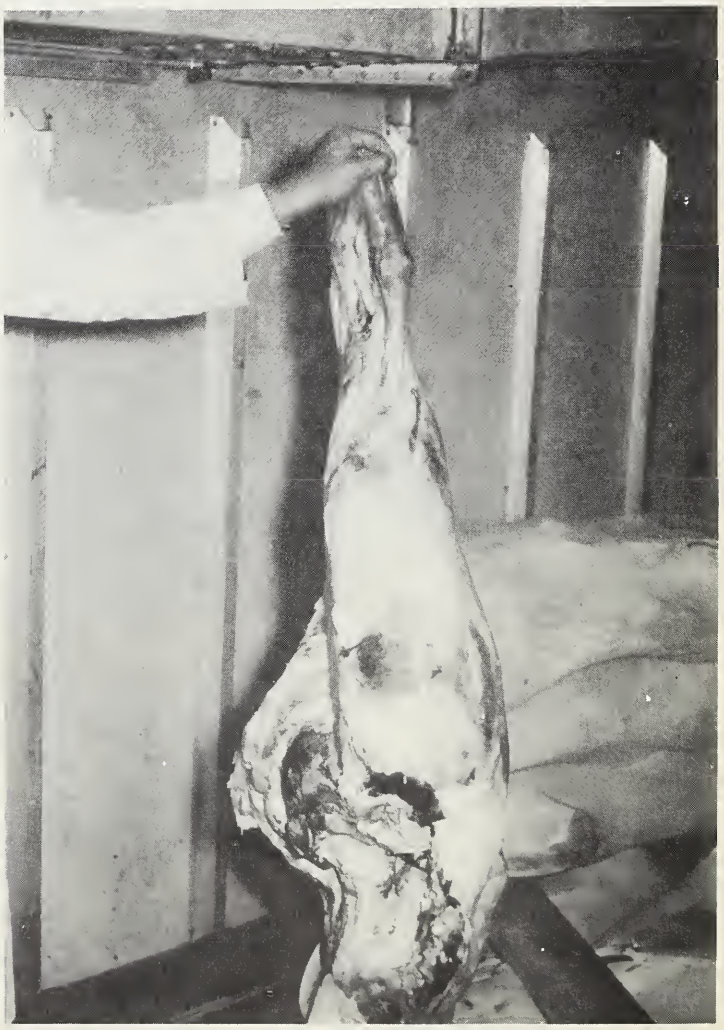

Figure 7.—Stacked beef hindquarter showing the compression of the round caused by overhead weight.

Figure 8.—Stacked beef quarters showing depressions caused by the 2-by-6-inch boards and stains on stockinettes.

All quarters of beef hung in rack B were hanging upon arrival in Rotterdam. Little or no blood staining of the stockinettes occurred, and all quarters were free of visible bacterial growth. Also, the beef showed no identations, abrasions, or detectable off-odor. The same was true for the beef in rack C.

Charges

When beef was stacked six layers high, the total transportation charge for fresh beef from St. Louis, Mo., to Paris, France, was 10.72 cents per pound—St. Louis to New York City, 1.42 cents per pound; New York to Le Havre, France, 7.90 cents per pound; and Le Havre to Paris, 1.40 cents per pound. If the beef were transported in rack A, the total charge from St. Louis to Paris would be 11.39 cents per pound—St. Louis to New York and Le Havre to Paris as given above; and New York to Le Havre, 8.57 cents per pound. The total charge for transporting the beef in rack B would be 16.22 cents per pound; New York to Le Havre, 13.4 cents per pound. Transporting the beef in rack C would cost a total of 25.79 cents per pound; New York to Le Havre, 22.97 cents per pound.

These charges are summarized in tables 4 and 5. They are based on actual charges paid by the Department of Defense and may differ from commercial movement.

Table 4.—Charges per pound of meat for shipment of fresh beef quarters in American-flag refrigerated holds to Paris, France, from selected origins in the United States

Stowage method	St. Louis, Mo.				Rochester, New York			
	St. Louis to New York [1]	New York to Le Havre [2]	Le Havre to Paris [3]	Total [4]	Rochester to New York [5]	New York to Le Havre [2]	Le Havre to Paris [3]	Total [4]
	Cents	*Cents*	Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
Stack, 6-high ____	1.42	7.90	1.40	10.72	1.00	7.90	1.40	10.30
Rack A _____	1.42	8.57	1.40	11.39	1.00	8.57	1.40	10.97
Rack B _____	1.42	13.40	1.40	16.22	1.00	13.40	1.40	15.80
Rack C _____	1.42	22.97	1.40	25.79	1.00	22.97	1.40	25.37

[1] Piggyback, 35,000-pound load, $499 per trailer.
[2] See table 5.
[3] Piggyback rate.
[4] Does not include duty payments, foreign taxes, insurance, and inspection fee at port of arrival.
[5] Piggyback, 35,000-pound load, $350 per trailer.

Table 5.—Port-to-port charge per pound of meat for fresh beef shipments from New York City, New York, to Le Havre, France, in American-flag refrigerated holds [1]

Stowage method	Inspection fee at New York	Stowage	Ocean freight rate [2]	Stevedoring at Le Havre	Total
	Cents	*Cents*	*Cents*	*Cents*	*Cents*
Stack, 6-high	0.02	[3] 1.77	5.77	0.34	7.90
Rack A	0.02	[4] 2.27	5.94	0.34	8.57
Rack B	0.02	[5] 6.27	6.77	0.34	13.40
Rack C	0.02	[6] 10.59	12.02	0.34	22.97

[1] Does not include duty payments, foreign taxes, insurance, or inspection fee at port of arrival.

[2] Based on rate of $51.20 per measurement ton (40 cubic feet of space).

[3] Includes dunnage and stevedoring charges, New York.

[4] This rack cost 0.79 cents per pound to construct and 1.48 cents per pound stevedoring. The construction cost includes the cost of material, labor for assembly and installation, and meathooks.

[5] Construction cost was 4.58 cents per pound, and stevedoring was 1.69 cents per pound.

[6] Construction cost was 7.59 cents per pound and stevedoring was 3 cents per pound.

Laid-Down Costs and Prices, Paris, France

At the June 1964 average wholesale price of U. S. Good Grade beef, f.o.b. St. Louis (33.16 cents per pound), the total laid-down cost in Paris, France, would be 44.55 cents a pound when shipped in rack A in a refrigerated hold. This cost does not include customs duties, taxes, insurance, and inspection charges at the port of arrival. The average wholesale price of fresh beef halves, first quality, roughly comparable to U. S. Good Grade, for the month of June 1964 in Paris was 54.63 cents per pound.

FOREIGN-FLAG SHIPS AND BANANA BOATS

Refrigerated space is available for shipment of beef on foreign-flag vessels. Foreign bottoms equipped with meat rails are presently employed in service between New Zealand, Australian, and South American ports to Europe. Because these vessels seldom call at North American ports, some rerouting would be required to make this service available from United States ports.

Because very little freight of this type has been offered to the foreign-flag vessels in the past, rates are not readily quoted. The operators have indicated that they would be willing to quote rates and reschedule vessels for American ports-of-call if they were offered a sufficient volume of traffic.

The use of banana boats for shipping fresh beef is not a promising alternative. Operators of these vessels point out two major obstacles. First, the shallow depth of the holds will not easily accommodate meat-rail installation that is necessary for hanging fresh beef. Second, these vessels are not presently routed to facilitate shipment of beef between American and European ports. They normally operate between South American and European ports, making New Orleans the principal port-of-call in this country.

The operators of banana boats indicate they would be willing to participate in meat movements if the volume were large enough, but seem to prefer frozen to fresh beef shipments.

CONCLUSIONS

1. If fresh beef moves into European markets from U. S. suppliers, refrigerated van containers and ships with refrigerated holds with racks for hanging beef are the best present methods of transport.

2. Stacking beef quarters more than one layer high adversely affects the shape and quality of the beef quarters enough to make this method of stowing unsuitable for overseas commercial shipments. Therefore, fresh beef should be transported in the hanging position, or stacked only one layer high.

3. A fairly inexpensive rack system developed for hanging fresh beef can be used to deliver beef to European markets in excellent condition.

4. American fresh beef presently can be put down in European markets at a reasonably competitive price by shipping it hanging in refrigerated van containers or hanging in refrigerated holds of American–flag vessels.

5. Fresh beef shipped in American–flag refrigerated holds reached European markets in excellent condition, but additional research is needed to establish the ability of refrigerated van containers to deliver fresh beef overseas in acceptable condition. The van shipments studied do not permit definite conclusions to be drawn because (1) the transit time—27 days—was unusually long, (2) the carcasses were not thoroughly chilled before loading, and (3) temperatures between 29° and 31° F. were not maintained in one van.

6. Additional research on methods of transport should make sales at current European prices more profitable to American meat producers and possibly enable them to participate more fully in the European beef market in the future when prices may be lower than they are today.

RECOMMENDATIONS

1. Fresh beef destined for overseas markets should be thoroughly chilled within 48 hours after slaughter of the animal and should be stored and transported at internal meat temperatures of 29° to 31° F. to maintain its quality.

2. Fresh beef for European markets should be moved through the marketing channels as rapidly as possible.

3. Beef for overseas markets should be free of bruises.

4. Additional research should be done (1) to obtain more information on the costs of transporting beef by both refrigerated van containers and ships' holds and (2) to determine ways to improve the maintenance of the quality of meat and reduce the cost of handling, loading, and unloading.

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